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AUTHOR Schmiess, Elmer
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ABSTRACT

This newsletter is published eight times during the academic year for teachers in an open educational setting. This issue is concerned with the plant and its environment. Activities explore different types of soils and their implications for indoor gardening, plant propagation techniques, and preparation of potting soils. Each activity provides an introduction, materials list, procedures, and vocabulary word list. Further pages in the newsletter list numerous sources for plants and materials, giving names and addresses for each. This source list also includes books and book series for students and teachers. (MA)

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Capturing Solar Energy in the Classroom with Plants

by Elmer Schmiess

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Introductions

by Clara A. Pederson

Do You Know

SE 022 813

Capturing Solar Energy in the Classroom with Plants

By Elmer Schmiess
University of North Dakota

INTRODUCTION

Does a sprouting bean seed have anything in common with an earthquake in Bolivia? Is there a commonality for all natural phenomena? Is there one overall categorical answer to all questions that children ask about science?

Fortunately, the response is "yes" for all three questions. The most pervasive behavior of nature is its attempt to establish harmony. Nature is a leveler, balancer, equalizer and adjuster to stress. Remember this refrain and keep humming it as you teach your next science class. The actual mechanism that creates the harmony is not as important as the holistic concept that nature thrives on equilibrium.

An earthquake in Bolivia adjusts the earth's interior to maintain the spherical shape of the earth. A nonspherical planet would quickly wobble out of orbit into oblivion. A hurricane over the Florida Keys is releasing energy that if not uncapped has the potential energy of destroying the earth. The welcome spring rain is nature's way of leveling the disharmony in the atmosphere. The warm rain triggers a chemical and physical bacterial action in the soil which, in turn, provides the energy for sprouting the bean seed. A gestaltic view of nature allows us to see order, elegant beauty and supernal appreciation for our environment. But at no time does a classroom plant experiment ever fail; plants consistently attempt to adjust to dissonant forces.

What we need to do is look at the totality of the plant's environment. My discussion of plants will focus on soil. Soil science is a neglected area in the elementary school. It apparently is neglected by city planners, energy seekers and by the public in general. The inflated price of soil is indicative of its great value.

Classroom activities with plants provide the contingencies for an appreciation of nature. Plants will dramatically demonstrate their response to disharmony by bizarre growth. The plants may sluff-off leaves, elongate stems, form premature flowers, develop shallow roots and even change the texture and chemistry of the soil. At other times, plants will match your expectations with luxurious growth.

SOIL

Establishing a good attitude towards the environment starts with the right vocabulary. "Don't call it dirt; this is soil," said the Earth Week speaker in his opening lecture. I was impressed with the simplicity of his remark because it conveyed a consequential attitude towards an important natural resource.

This attitude was also stated by J. I. Rodale who started the Earth Week movement some 30 years ago: "The organic way is the golden-rule way. It means that we must be kind to the soil, to ourselves and to our fellow men." Who would take issue with this philosophy? It succinctly summarizes an important objective of education. The implementation of this objective can be accomplished by having the children investigate the composition of soil.

Activity I-Soil Classification

What is the Composition of Soil?

A simple settling method with a fruit jar and Calgon is one easy way that the children can discover the components of soil. It is based on the fact that some soil particles suspended in water settle more rapidly than others depending on the amount of surface area. Fine-textured soils of clay have a greater surface area and settle slower than coarse-textured soils like sand. Sand settles the fastest, silt somewhat slower and

clay is the last to settle. It usually takes hours for clay to settle. After the soil aggregates are dispersed the fruit jar test separates sand, silt and clay.

To disperse the particles two treatments are necessary. First add ordinary Calgon (sodium phosphate compound) which can be bought in grocery stores. (Do not use the bath oil type.) Calgon has the chemical ability to cause individual particles to repel each other. The second treatment is vigorously shaking the jar. Vigorous shaking is important because if two particles stick together they may settle as silt and the final results will be in error.

Materials

125 ml (1/2 cup) soil
75 ml (5 tablespoons) of 8% Calgon solution (To make 8% Calgon solution dissolve 90 ml (6 tablespoons) of Calgon powder in 1 liter (quart) of water.)
750 ml (3 cups) clean water
1 liter (quart jar with lid)
1 ruler (preferably metric)

Procedure

Place soil in jar and add the 75 ml of 8% Calgon solution and then add the 750 ml of water. Put the lid on and shake the jar for 5 to 10 minutes. At this point I get student involvement. Each student can shake the jar for about 30 seconds. After this treatment the jar is stored until the next class period which should be no less than 24 hours.

Twenty-four hours later we measure the depth of soil that has settled. This data is recorded. The jar is again agitated but for only five minutes at which time it is placed on the table for 40 seconds. During these important 40 seconds all the sand will settle; measure the sand layer at the end of the 40 seconds. Without disturbing the jar, wait 30 minutes and again measure the depth of the settled soil. During the 30 minutes, all the silt will be settling. The difference between the height of the sand layer and silt layer is the measurement of the silt. Record this difference. All that remains suspended in the jar is clay, the difference between the silt level and the initial total represents the clay fraction.

This is the data collected and recorded by a third grade class. The soil sample was garden soil and was an exceptionally good sample.

Total depth of settled soil (24 hours of settling)	30 mm
Depth of sand layer (40 seconds of settling)	10 mm
Depth of silt layer (30 minutes of settling)	10 mm

Converted to percentages these would be:

sand 10/30 x 100% = 33 1/3%
silt 10/30 x 100% = 33 1/3%
clay 100% - (33 1/3% + 33 1/3%) = 33 1/3%

The analysis of this soil sample is equal parts clay, silt and sand. Collectively it is called LOAM and is the most desirable soil and is suited for most outdoor plants. If all three components, sand, silt and clay are present and if sand is predominant the soil is called sandy loam. Likewise, if silt is predominant the soil is called silty loam and if clay is predominant the soil is clayish loam. The naming of soils that contain only two components is also prefixed by the most abundant part, examples are sandy clay or silty clay. Soils of only one component are rare and not very desirable.

Activity II
Language Experience with Soils

In this activity the students will prepare soil potting mixtures, water the soil, observe the drying stages and determine the merits of their mixture. No plants or seeds are necessary in testing the soil. (It is highly recommended that all potting soil should be tested prior to the actual use.)

Vocabulary is an essential part of this activity. It will be necessary that the student understands what each soil component means.

Word List

1. sand - Sand feels rough and gritty and is made up of visible particles that are about one millimeter in size.

Sand does not soak up water but can hold a little water on the surface of the particles. Sand does not provide any food for the plant but it does provide needed air space for the roots. Sand does not compact and it is called stable.

2. silt - Silt feels smooth and powdery and will make hard clods when dry. The individual particles are hard to see because they are only .05 millimeters in size. Silt does not supply any food for plants but does furnish a nucleus for building soil granules. The granules make the soil loose and porous.

3. clay - Clay feels sticky when moist and when worked with the fingers the clay forms ribbons. The clay particles are very small, about .002 millimeters in size. The platy clay particles compact very easily, but they do supply important food for the plant. In addition to the food, the clay holds much water but does not leave room for air.

4. loam - Loam is essentially an equal combination of sand, silt, clay and some organic matter. Loam is a good soil but for indoor gardening can be improved with Sphagnum moss and vermiculite.

5. vermiculite - Vermiculite is a lightweight water absorbent that contains magnesium. Magnesium is essential for plant growth.

6. Sphagnum peat moss - This is a special kind of peat moss that grows in wet acid areas. It can hold a great deal of water and inhibits the growth of harmful fungus.

7. bone meal & fish emulsion - These are low profile organic fertilizers that will not burn the plants or change the texture of the soils.

Materials

100 twigs or small sticks
100 styrofoam cups
4 liters (1 gallon) garden soil (If not available, commercial potting soil can be used.)
4 liters sand (It is easier to buy washed sand from a sand & gravel company or lumber yard than doing it yourself.)
4 liters clay (Pick up at an excavation for a basement.)
4 liters vermiculite (Pick up at a garden store.)
4 liters Sphagnum moss (Garden store.)

You will need measuring cups, mixing containers, and water to complete the experiment. (Silt was not included in the materials list since the sand and clay will contain a small fraction of silt.)

Procedure

I divide the class into four or five committees and each group selects a chairperson. The committees decide how they are going to prepare their soil mix. Once that decision is made, the soils are mixed and transferred to the styrofoam cups. A stick is placed in the potting soil, and the mix is saturated with water. The cups are placed in sunlight and allowed to dry for several days. The test comes when the soil is dry. What is the condition of the dry soil? Can the stick be removed readily or is it glued to the soil? If the dry soil is porous and the stick can be easily removed, chances are the soil would be suitable for plants.

I have found it helpful to talk about trying to get some balance in the different soil components. If the students know the function of each component, they do a good job in selecting a variety of ingredients. The desirable potting mixes can then be used for growing seeds or plant parts.

WHAT ARE THE IMPLICATIONS FOR SAND, SILT, AND CLAY FOR INDOOR GARDENING?

It is obvious that if we wish to grow indoor plants, we have to supply their roots with a growing medium that makes air, water and nutrients readily available. The single most important soil characteristic in determining whether air, water and food will be maintained is the size of the soil particles. Soil size largely controls the structure, aeration and moisture contents of the growing medium and thus ultimately determines whether anything will grow and how well it will grow. This again brings us back to the three basic soil particles - clay, silt and sand. These particles hold water on their surfaces. Water sticks there, held by a cohesive force called surface tension. After such a particle has been wetted, it holds a thin film of moisture only on its surface not inside. So, the greater the surface area of a given amount of soil, the greater the amount of water it will hold by surface tension.

Let us assume that we can enlarge a particle of sand that measures one inch on each side. It has a volume of one cubic inch. It has a surface area of six square inches. If you grind this giant size particle into eight pieces, each piece will measure one-half inch per side. It will still have the same volume but will have a surface area of twelve square inches. If you further pulverized the grain of sand into smaller pieces you would constantly increase the surface area. Now it should be apparent that the smaller the particles of soil, the greater the total surface area.

Since clay consists of the smallest particles it concomitantly holds more water than any other soil. The United States Department of Agriculture has determined that a gram of sand has a surface area of 45.4 square centimeters, silt has a surface area of 453.7 square centimeters, but a gram of clay has a surface area of 11,242.5 square centimeters. Considering all of this it is obvious why soils containing large amounts of small grained particles of clay are called "heavy" or "wet" soils. The clays have tremendous surface areas and so hold proportionately large amounts of water. All the water makes the clay soils heavy.

Not only do clay soils retain water but also permit beneficial bacteria to come in contact with large surface areas. The bacterial contact provides soluble nutrients from the clay. Thus all things considered, clay is an "active" soil component. It holds lots of water for roots to absorb and it is a primary source of mineral nutrients for plants. Clay supplies almost everything a plant needs except air. Unfortunately, because clay holds so much water it has no space left between particles for air.

The implication of clay soil for a potting medium is problematical. Soil must contain a certain amount of oxygen for roots to survive. A waterbound plant does not die because it has too much water but because it has no air. The water displaces the air and there is no way air can move into the saturated soil.

Another negative aspect of clay is its lack of structural strength. You have all played with modeling clay and recognize that clay can be deformed, compressed and compacted with ease. Compare this lack of stability with sand. Can sand be compacted? If you were selecting a building site would you pick a clay or sand bed? If you selected a sand layer for your building site you will have a secure foundation. If you select a sand medium for your potted plants it will have ample air space, good drainage but no nutrients. Neither sand or silt supply nutrients to plants. Silt scarcely provides air space but it does have structural strength and avoids compacting of the soil. Silt's primary function is providing a matrix for building soil granules. Granules are little clumps of soil about the size of bread crumbs. Soil consisting of granules is very porous and has a consistency of cork. Soil forms granules when organic matter, clay, silt and sand are present.

Organic Matter

The ideal soil structure contains granules, small clumps of soil stuck together by sticky substance. Most soil granules are

formed by the secretion of microorganisms as they digest whatever organic material is in the soil. These bacteria consume leaves, peat, or any other decaying substance just as they do in a compost pile. In this process, the bacteria produce materials of the consistency of glue. Sand, silt, clay and organic matter are glued together by this bacteria action and form granules. Granules are beneficial because they increase the air space around the root which promotes easy root movement and quick drainage of excess water. The indoor gardener is very mindful of the benefit of soil granules and attempts to maintain this soil structure.

Soil that is structured in granules can break down. Repeated watering will wash away the glue-like secretion. The excess weight of the water or someone walking on the soil or even the growth of roots in a pot can gradually compact the soil to the point where granules disappear. Soil granules are often destroyed when potting plants. Excess pressure on wet soil will compact the soil and destroy the granules. The structure of the soil, soil granules, are at least as important as the size of the soil particles. One of the best ways to avoid destroying soil granules is reduce watering.

Organic material acts like sponges in soaking up water. Peat moss will absorb large quantities of water, store the water and slowly release it to the soil. Organic additives are usually very coarse. They produce large pores in the soil that promote drainage and air circulation.

Plants growing outdoors have soil that have virtually unlimited depth. In the soil are extremely long channels that start on the surface and reach deep into the earth. Gravity pulls moisture down through these pores and as the water moves down it sucks air into the soil. This gives the roots a good supply of the much needed air. Contrast this to potted plants that have a limited pot length. It is difficult to create a suction to draw air to the roots.

Preparing Potting Soil

Essentially the indoor gardener should hum this refrain, "I need sand for good drainage and air space, lots of Sphagnum moss to absorb moisture, loam for soil granules and food, and magnesium from vermiculite." My own indoor mix is:

1 part sand
1 part Sphagnum moss
1 part loam (garden soil)
1 part vermiculite

Sand

If you collect your own sand be sure to wash it with hot tap water. Set it in the sun to completely dry before storing. An alternative is to go to a lumber yard and buy washed silica sand.

Sphagnum Moss

Any plant shop will have shredded Sphagnum -- be sure it is Sphagnum and not peat moss.

Loam

I use my own garden soil. I have discontinued sterilizing the soil and have had no problem with fungus. The Sphagnum moss is a good fungicide. I thoroughly wet the soil before I store it in plastic bags.

Vermiculite

Vermiculite is sort of a filler but I also like the magnesium that this mineral provides. Magnesium is to plants like iron is to people, very essential.

Asexual Reproduction

Spare Parts

During the last few years I have combined my starting from seed with vegetative reproduction. Most children have had some experience with seeds but not with slips.

A part of a leaf, a leaf, a leaf with its stem, and stems with leaves all can be used to produce new plants. In most cases roots

will form where the leaf or the stem comes in contact with the rooting medium. There seems to be a concentration of roots at the nodes, the node is the place where the leaves are attached to the petiole. The original leaf is seldom a part of the new plant. You should choose one of the best looking leaves on the plant when making a leaf cutting. Select a leaf in perfect health and one that is mature. When propagating succulents, I usually remove the cutting one day before placing it in a medium. This reduces the chance of rot.

Parts of Leaf

Snake Plant & Rex Begonias

For Sansevieria cuttings take a leaf, cut it into sections three or four inches long and mark the leaf parts in such a way that the pieces are planted right side up. Cutting a small notch out of the top of each section will help you remember the top side.

Rex Begonias can be propagated by cutting a leaf into a number of pieces so that each piece contains part of a large vein. If the leftover pieces are thin, discard, but if the leaf is large, the outside can be rolled into a cone, planted in a pot and filled with growing media.

Whole Leaf

Piggy Back Plants & Peperomia

Leaves can be laid on damp potting mix and kept in a warm humid spot until new plantlets appear. To encourage growth make cuts into the veins of the leaves and keep the cut places in contact with the soil. A large piece of gravel placed on the leaf will secure it.

A Leaf and Its Stem

A healthy African violet leaf can be snapped or cut off its plant and put into a partially filled glass of water. This method works as well as covering the top of a glass of water with wax paper or aluminum foil and putting the stem through the opening.

A leaf with a one to two inch stem can also be inserted in moist vermiculite or potting soil. Cover the leaf with an inverted jar or enclose the pot and the leaf in a clear plastic bag.

Stems with Leaves and Leafy Stems

Coleus, Wandering Jew and Swedish Ivy all do rather well if terminal growth is pinched off and the cutting placed in growing medium. I like the Jiffy-7-Peat Pellet (obtained from garden stores) for starting slips. The children enjoy watching the pellet expand when it is submerged in warm water. When fully expanded a hole is punched in the pot and the slip is inserted. A dull pencil is helpful in punching the hole in the Jiffy-7-Peat pellet. Make a special effort to firm the peat pot so the growing medium is in contact with the slip. The completed project is then covered with a plastic bag and set in a warm spot away from direct sunlight. In a week you can transplant the growing slip to a hanging basket. (You might want to put several slips in the hanging pot.)

An Alternative Method of Propagation

Step-by-Step Procedure for Starting Swedish Ivy

1. The best cuttings come from the ends where the plant is showing growth. If possible, use cuttings with three sets of leaves and trim off the lowest set of leaves. Growth will be profuse at the point where the leaves were removed.
2. Put three inches of damp potting mix in the bottom of the plastic bag. The potting mix might be equal parts vermiculite, Sphagnum moss and loam.
3. Push the stem of the cutting into the potting mix.
4. Add dated label that can be read from the outside.
5. Close the top of the bag.
6. Move the bag to a place where it can receive indirect light. (Keep out of direct sunlight.)

7. In a week or two roots will have developed on the slip. The new growth of roots are usually visible and also you will see new leaf growth.

8. Open the top of the bag and let the plants become conditioned to the outside world. This hardening period requires about three days.

9. The plants are now ready to pot. Lift out each plant gently by digging around it with your fingers and then place it in a container containing a potting mix. Water when the soil begins to show dryness and when the plant has grown an inch or more pinch it back. Pinching it back means removing the terminal set of two leaves. Pinching it back will result in a fuller and more bushy plant.

Improving Results of Cuttings

Good light, high humidity and air temperature that does not get much above 80 degrees F will give you the optimum results. Bottom heat applied to keep the rooting medium warmer than air temperature encourages root growth and gives the roots a head-start over the stem and leaves. Rooting hormones are helpful in starting some slips, follow directions printed on the container.

STARTING FROM SEED

Sexual Reproduction

A viable seed is a developing embryo that has the potential of developing into a plant. The seed is a bundle of basic requirements needed to nurture the embryo until it is self sufficient. Seeds contain a primary root and a primary shoot attached to an original or "seed leaf" called cotyledons. These elemental parts are packaged in a coating of one kind or another. On one end of the coating is a small scar where the seed was attached to the parent. Close to this scar is a hole through which the roots will grow when the time is right. Inside the coating is a certain amount of stored nutrients that will be used to produce the enormous amount of energy that is needed for the embryo to develop and exist on its own.

Activity III
The Magic Bean

The picture on the cover is Kentucky Wonder bean plants that were planted November 4, 1976 and these beans reached the height of eight feet in one month. This is a very exciting experience for children to see the rapid growth of pole beans.

1. Start the pole beans in a small container, styrofoam cup, paper cup or a two-inch peat pot. (Seed is available from garden suppliers.)

2. After the bean is six inches tall transfer it to a half-gallon milk carton. When you make this transplant be sure to set the plant deeper than the original planting. Actually you can set it as deep as the first set of true leaves. (The two emerging leaves are the cotyledons and are not true leaves.) The set of leaves above the cotyledons are true leaves.

3. The last transplant is made by transferring the milk carton pots to a four-quart pail. Put three of the plants into the large pail and spot them along the circumference of the pail. In the center of the pail insert a wooden window screen molding that will reach the ceiling. Attempt to get the molding the length so it will reach the ceiling when one end is inserted in the potting pail. The molding does not have to be attached to the ceiling. It will be secure as long as it is pushed firmly against the ceiling.

I have been using garden loam soil for the potting medium. The only precaution that I take is in the first pot before the seed has germinated. I fill this small pot with garden soil and then punch out a small hole that is filled with Sphagnum moss. The moss insulates the seed against coming in contact with the unsterilized garden loam. Once the bean seed has germinated it is resistant to fungus and will thrive. Remember that moss will absorb a great deal of water and it is necessary to supersaturate the moss and the seed. If the moss starts getting dry, it will rob moisture from the bean seed. The reason the seed is placed in contact with the Sphagnum moss is to prevent damping off. This species of moss is acidic and also has other fungicial properties.

Don't hesitate to have children work with plants so that they will capture the solar energy in the classroom.

Sources for Plants and Materials

House Plants and Seeds

Alberts & Merkel
2210 S. Federal Hwy.
Boynton Beach, Fla. 33435
(Plant list 50¢)

Buell's Greenhouses
Weeks Rd.
Eastford, Conn. 06242
(Catalog 25¢, plus long self-addressed, stamped envelope)

John Brudy's Rare Plant House
P. O. Box 1348
Cocoa Beach, Fla. 32931
(Exotic seed catalog $1.00, deductible from order of $7.50)

W. Atlee Burpee
300 Park Ave.
Warmsinster, Pa. 18991

Cooks Geranium Nursery
712 North Grand
Lyons, Kansas 67554

Easterbrook Greenhouses
10 Craig St.
Butler, Ohio 44822
(Catalog $1.00)

Henry Field Seed Co.
Shenandoah, Iowa 51601

George Park Seed Co.
Greenwood, S. C. 29646

Greenlife Gardens
Route 3, Box 613
Griffin, Ga. 30223
(Enclose two first-class stamps)

The House Plant Corner Ltd.
Box 810
Oxford, Md. 21654

J. L. Hudson, Seedsman
P. O. Box 1058
Redwood City, Cal. 94064
(Large catalog, listings in Latin, 50¢. Other lists free.)

Loyce
Rt. 2, Box 11
Granbury, Tex. 76048

Merry Gardens
Camden, Maine 04843

Wilson Bros.
Box 21
Roachdale, Ind. 46172

African Violets and Gesneriads

Buell's Greenhouses
Weeks Road
Eastford, Conn. 06242
(Catalog 25¢ plus long, self-addressed, stamped envelope)

Easterbrook Greenhouses
10 Craig St.
Butler, Ohio 44822
(Catalog $1.00)

Fischer Greenhouses
Linwood, N. J. 08221

Albert Krieger
1063 Cranbrook
Jackson, Mich. 49201
(Enclose self-addressed, stamped envelope)

Lyndon Lyon
14 Mutchler St.
Dolgeville, N. Y. 13329

Tinari Greenhouses
2325 Valley Rd.
Box 190
Huntington Valley, Pa. 19006
(Catalog 25¢)

San Francisco Plant Co.
P. O. Box 575
Colma Station
Daly City, Cal. 94014
(Plant lists 25¢)

Bromeliads

Kent's Bromeliad Nursery
6528 Bedford Ave.
Los Angeles, Cal. 90056
(Catalog 50¢)

Marz Bromeliads
10782 Citrus Drive
Moorpark, Cal. 93021
(Plant list 35¢)

Seaborn DelDios Nursery
Rt. 3, Box 455
Escondido, Cal. 92025
(Catalog $1.00, deductible from order)

Talnadge's Fern Gardens
354 "G" Street
Chula Vista, Cal. 92010

Bulbs, Corms and Tubers

P. de Jager & Sons
188 Asbury St.
S. Hamilton, Maine 01982
($1.00 puts you on mailing list for a year)

Oregon Bulb Farms
Gresham, Ore. 97030

John Messelaar Bulb Co.
Box 269
Ipswich, Maine 01938

Van Bourgondien's
245 Farmingdale Rd.
R. 109. Box A
Bablylon, N. Y. 11702

Cactus and Succulents

Abbey Garden
176 Toro Canyon Rd.
Carpinteria, Cal. 93013
(Catalog 50¢)

Cactus by Mueller
10411 Rosedale Hwy.
Bakersfield, Cal. 93308

Desert Plant Co.
P. O. Box 880
Marfa, Texas 79843
(Catalog $1.00)

Far Out Cactus
1027 Lenape Rd.
West Chester, Penn. 19380
(Catalog 25¢)

Fernwood Plants
1311 Fernwood Pacific Dr.
Topanga, Cal. 90290

Frand Bowman
771 Williams Ave.
Brooklyn, N. Y. 11207

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1345 N. Brawley
Fresno, Cal. 93705
(Catalog 25¢)

Oakhill Gardens
Rt. 3, Box 87C
Dallas, Or. 97338
(Hardy sempervivums and sedums)

New Mexico Cactus Research
(seeds)
P. O. Box 787
Belen, N. M. 87002
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Reseda, Cal. 91335

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4223 Pershing
Ft. Worth, Tex. 76107
(Catalog 35¢)

Carnivorous Plants

Peter Pauls Nurseries
Canandaigua, N. Y. 14424
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Harold Welsh
266 Kipp Street
Hackensack, N. J. 07601

Ferns

Alberts & Merkel
2210 S. Federal Hwy.
Boynton Beach, Fla. 33435
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Arant's Exotic Greenhouses
Rt. 3, Box 972
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Gardens of the Blue Ridge
Ashford, N. C. 28603

Putney Nursery
Putney, Vt. 05346

Savage Gardens
P. O. Box 163
McMinnville, Tenn. 37110

Miniature Roses

Nor'east Miniature Roses
58 Hammond Street
Rowley, Mass. 01969

Sequoia Nursery
2519 E. Noble Ave.
Visalia, Cal. 93277

Mini Roses
P. O. Box 4255
Station A
Dallas, Tex. 75208

Conrad-Pyle Co.
West Grove, Penn. 19390

Wyant Roses
Johnny Cake Ridge Rd.
Mentor, Oh. 44060

Orchids

Affiliated Orchid Growers of Florida
126 Wild Orchid Lane
Orange Park, Fla. 32073

Alberts & Merkel
2210 S. Federal Hwy.
Boynton Beach, Fla. 33435
(Catalog 50¢)

Fennell Orchid Co.
26715 S. W. 157th Ave.
Homestead, Fla. 33030

Finck Floral Co.
9849-GKimker Lane
St. Louis, Mo. 63127

Arthur Freed Orchids
5731 S. Bonsall Dr.
Malibu, Cal. 90265
(Catalog $1.00)

Geiger Orchids
P. O. Box 245
Welbourn, Fla. 32094

Hausermann's
P. O. Box 363
Elmhurst, Ill. 60126
(Catalog $1.00)

Lager & Hurrell
426 Morris Ave.
Summit, N. J. 07901
(Catalog $2.00, refunded on first order of $10.00)

Penn Valley Orchids
239 Old Gulph Road
Wynnewood, Pa. 19096

Rare Bulbs, Plants & Seeds

International Growers Exchange
P. O. Box 397
Farmington, Mich. 48024
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Brooklyn Botanic
1000 Washington Ave.
Brooklyn, N. Y. 11225

HHH Horticultural
68 Brooktree Rd.
Hightstown, N. J. 08520

Mrs. J. Martin
National Indoor Light
Gardening Society
423 Powell Drive
Bay Village, Ohio 44140

Roehrs Book Division
P. O. Box 125
E. Rutherford, N. J. 07073

Introductions

Peggy Brogan and Bill Martin Jr. are two very innovative and creative individuals who constantly keep in touch with children. As a result, they are attuned to their interests and needs which, in turn, assists them in creating materials for children to listen to, to read and to enjoy. They are the authors of the Sounds of Language, a literary-based reading program for grades kindergarten through eight. Cassette recordings also accompany each of the books from pre-primer through grade eight. Bill Martin reads the selections and then children may join in the reading - all to the musical backgrounds of Al Caiola, the well-known guitarist. Books in the Sounds of Language series are:

SOUNDS I REMEMBER 1974 (Pre-Primer 1)
SOUNDS OF HOME 1972 (Pre-Primer 2)
SOUNDS OF NUMBERS 1972 (Primer 1)
SOUNDS OF A HOUND DOG 1974 (Primer 2)
SOUNDS AROUND THE CLOCK 1972 (Reader 1-1)
SOUNDS IN THE WIND 1974 (Reader 1-2)
SOUNDS OF A POWWOW 1974 (Reader 2-1)
SOUNDS OF LAUGHTER 1972 (Reader 2-2)
SOUNDS AFTER DARK 1974 (Reader 3-1)
SOUNDS OF THE STORYTELLER 1972 (Reader 3-2)
SOUNDS OF MYSTERY 1972 (Reader 4)
SOUNDS OF A YOUNG HUNTER 1972 (Reader 5)
SOUNDS OF A DISTANT DRUM 1972 (Reader 6)
SOUNDS JUBILEE 1973 (Reader 7)
SOUNDS FREEDOMRING 1973 (Reader 8)

Peggy and Bill are the authors of the Instant Readers; three levels of books with ten titles in each level. Read-along cassette recordings are also available for each level - Levels I, II and III.

The Owl Books, edited by Bill Martin, provide individualized reading materials for kindergarten to grade six. These books may be purchased individually or in the following sets:

Little Owl Books (K - 2)
Set of 40 books - 10 arithmetic, 10 literature, 10 science, 10 social studies.

Young Owl Books (2 - 4)
Set of 40 books (same number in each area as in the above).

'Vise Owl Books (4 - 6)
Set of 20 books - 5 arithmetic, 5 science, 5 literature, 5 social studies.

All of the books and cassettes listed thus far may be obtained from:

Holt, Rinehart and Winston
383 Madison Avenue
New York, New York 10017

The Bill Martin Freedom Books and Recordings are short, memorable "happenings." In the recordings, (record or cassette), Bill discusses the social implications of each book and the opportunities for human problem solving. He also poses provocative questions to stimulate investigation and inquiry. Titles of the books are:

I AM FREEDOM'S CHILD
ONCE THERE WERE BLUEBIRDS
AMERICA I KNOW YOU
POOR OLD UNCLE SAM
IT'S AMERICA FOR ME
SPOILED TOMATOES
ADAM'S BALM
I REACH OUT TO THE MORNING
FREEDOM'S APPLE TREE
GENTLE GENTLE THURSDAY

These books, teacher's guide, records or cassettes may be obtained from:

Bowmar Publishing Company
4563 Colorado Boulevard
Los Angeles, California 90039

The Little Nature Books are a read-aloud series by Bill Martin Jr. for beginning readers. This set includes ten books with ten corresponding cassettes. The ten story books are:

POPPIES AFIELD
FROGS IN A POND
BUTTERFLIES BECOMING
GERMINATION
ANTS UNDERGROUND
A MUSHROOM IS GROWING
A HYDRA GOES WALKING
MOON CYCLE
MESSENGER BEE
JUNE BUGS

The above multimedia kit is available from:

Encyclopedia Britannica
Educational Corporation
425 North Michigan Avenue
Chicago, Illinois 60611

The philosophy of all of the books listed above can best be expressed by quoting Bill Martin: "Our job is to give children a rich storehouse of buoyant language models, which, when securely anchored in their ears, transfer readily to the tongue and to the eye for reading, writing and speaking."

Do You Know

. . . Science on a Shoestring by Herb Strongin, the resource book that contains more than fifty simple classroom-tested experiments using materials that cost about fifty to eighty cents per pupil per year? The activities are grouped under three conceptual themes; namely, scientific methods; change; energy, fields and forces. Within these concept areas, children perform experiments on the five senses, solids, liquids, gases, plants, gravity, air, electricity and magnets.

Children, by working in pairs and with the support and supervision of the teacher, may perform the experiments themselves. Additional activities include investigations that may be done at home.

This excellent 1976 book is one of the INNOVATIVE SERIES published by:

Addison-Wesley Publishing Company
2725 Sand Hill Road
Menlo Park, California 94025

. . . Roots of Open Education, proceedings of the conference held at City College? This publication consists of many various reminiscences, addresses by Joseph Featherstone, David Hawkins, Paul Nash and Vito Perrone, pictorial representations and an annotated bibliography.

This interesting and informative publication may be obtained by sending $5.00 for each copy to:

Workshop Center for Open Education
City College
6 Shepard Hall
140th Street and Convent Avenue
New York, New York 10031

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